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Field Sampling Plan for Group 3, PM-2A Tanks for Test Area North, Waste Area Group 1, Operable Unit 1-10

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Prepared for the
U.S. Department of Energy
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Approved by

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ABSTRACT

This field sampling plan describes the Waste Area Group 1, Operable Unit 1-10, Group *3* remedial action field sampling activities to be performed at the Idaho National Engineering and Environmental Laboratory for the PM-2A Tanks (Technical Support Facility-26) site. The sampling activities described in this plan support the remedial actions presented in the *Record of Decision for Test Area North, Operable Unit 1-10,* and are in accordance with the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*.

Data quality objectives for this sampling plan address all sampling requirements identified for the remedial actions. The results of these sampling efforts will support post-excavation confirmation sampling to ensure that the final remediation goals for the site have been met.

This field sampling plan supports the site-specific remedial actions, including sampling, quality assurance, quality control, and analytical procedures. Full implementation of the field sampling plan will ensure that the final remediation goals established in the Record of Decision are met at the site, and that data are scientifically valid, defensible, and of known and acceptable quality. The *Quality Assurance Project Plan for Waste Area Group 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites,* describes quality assurance/quality control protocols that will achieve the specified data quality objectives.

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ACRONYMS

AA	alternative action
AL	action level
ARAR	applicable or relevant and appropriate requirement
BBWI	Bechtel BWXT Idaho, LLC
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DOT	U.S. Department of Transportation
DQO	data quality objective
DS	decision statement
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ESH&Q	environment, safety, health, and quality
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
FRG	final remediation goal
FSP	field sampling plan
FTL	field team leader
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations
HPGe	high-purity germanium

HSO	health and safety officer
HWMA	Hazardous Waste Management Act
ICDF	INEEL CERCLA Disposal Facility
IDEQ	Idaho Department of Environmental Quality
IET	Initial Engine Test
IH	industrial hygiene
INEEL	Idaho National Engineering and Environmental Laboratory
LOFT	Loss-of-Fluid Test
MCP	management control procedure
NaI	sodium iodide
NLCI	no-longer-contained-in
OSHA	Occupational Safety and Health Administration
ou	operable unit
PCB	polychlorinated biphenyl
PM	project manager
PPE	personal protective equipment
PRD	program requirements document
PSQ	principal study question
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RA	remedial action
RadCon	radiological control
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial desigdremedial action
RI/FS	remedial investigation/feasibility study

ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
SAP	sampling and analysis plan
SMC	Specific Manufacturing Capability
SVOC	semi-volatile organic compound
TAN	Test Area North
TCLP	toxicity characteristic leaching procedure
TSF	Technical Support Facility
UCL	upper confidence limit
UST	underground storage tank
VOC	volatile organic compound
WAC	Waste Acceptance Criteria
WAG	Waste Area Group
WGS	Waste Generator Services
WMP	waste management plan
WRRTF	Water Reactor Research Test Facility

Field Sampling Plan for Group 3, PM-2A Tanks for Test Area North, Waste Area Group 1, Operable Unit 1-10

1. INTRODUCTION

This field sampling plan (FSP), when implemented with the current revision of the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites* (Quality Assurance Project Plan [QAPjP]) (U.S. Department of Energy Idaho Operations Office [DOE-ID] 2002a), comprises the sampling and analysis plan (SAP) for the Idaho National Engineering and Environmental Laboratory (INEEL) Waste Area Group (WAG) 1, Test Area North (TAN), Operable Unit (OU) 1-10, Group 3 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remedial actions (RAs).

This FSP, prepared in accordance with the *Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991), outlines the sampling requirements, quality assurance (QA), quality control (QC), and analytical procedures. These are used to determine if the final remediation goals (FRGs) established in the Record of Decision (ROD) for OU 1-10 (DOE-ID 1999) have been met. The QAPjP describes QA/QC protocols that will be followed to achieve the specified data quality objectives (DQOs). Use of this FSP will help ensure that data are scientifically valid, defensible, and of known and acceptable quality, while use of the QAPjP will ensure that the data generated are suitable for their intended purposes.

This FSP is identified as a secondary document under the FFA/CO and fulfills the specified FFA/CO requirements. The QAPjP and this FSP have been prepared pursuant to the *National Oil and Hazardous Substances Contingency Plan* (U.S. Environmental Protection Agency [EPA] 1990), the *Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act* (EPA 1988), the FFA/CO and Environmental Restoration (ER) Management Control Procedure (MCP)-241, "Preparation of Characterization Plans."

1.1 Field Sampling Plan Objectives

The overall objective of this FSP is to guide the collection and analyses of samples following implementation of the selected RAs for the PM-2A Tanks site presented in the OU 1-10 ROD. The ROD-selected remedy for the PM-2A Tanks includes excavating the soil above and around the tanks, removing the Resource Conservation and Recovery Act (RCRA)-listed tank contents, sampling the soil and tank contents and disposing of them appropriately, performing confirmation sampling, and backfilling the excavation with clean fill. During development of the project remedial desigdremedial action (RD/RA) work plan (DOE-ID 2003a), minor deviations to the ROD-selected remedy were identified, resulting in a decision to remove the tanks and dispose of them at the INEEL CERCLA Disposal Facility (ICDF), rather than decontaminating them and leaving them in place. This deviation of the remedy is consistent with the intent of the ROD. The PM-2A tanks site remediation combines both RCRA requirements as defined in the Hazardous Waste Management Act (HWMA)/RCRA Closure Plan for the TAN/Technical Support Facility (TSF) Intermediate-Level Radioactive Waste Management System, (HWMA/RCRA Closure Plan) (DOE-ID 2003b) and CERCLA requirements as defined in the OU 1-10 ROD. Based on the DQOs developed for the project's sampling requirements, this FSP will support post-remediation sampling to verify that the CERCLA ROD-defined FRG for Cs-137 has been met. It is assumed that the tanks have not leaked; therefore, neither the soil beneath the tanks nor the concrete cradles will be removed. The soil beneath the tanks will be visually inspected for evidence of a release and confirmation sampling of the soil will be performed. If there is evidence of a release, the sand and cradles will be removed and the Closure Plan FSP will be implemented to sample the soil beneath the cradles for RCRA constituents. This FSP will be implemented to perform confirmation sampling in the excavated areas after the Closure Plan requirements have been met.

1.2 INEEL CERCLA Disposal Facility Requirements

This FSP is designed to assist in ensuring that the soil wastes generated during implementation of the PM-2A tanks RA will meet associated waste characterization requirements for waste disposal at the ICDF or other approved facility. The ICDF Complex is designed to provide centralized receiving, inspection, and treatment and segregation areas necessary to stage and store incoming waste from various INEEL CERCLA remediation sites prior to disposal at the ICDF Landfill or evaporation ponds, or shipment off-site. Only INEEL on-site CERCLA wastes meeting the appropriate ICDF Waste Acceptance Criteria (WAC) (DOE-ID 2002b) will be accepted at ICDF.

A material profile of the PM-2A tanks site waste planned for disposal at ICDF will be developed per the *ICDF Complex Material Profile Guidance* (DOE-ID 2003c) prior to waste disposal. Verification of the waste will be performed by ICDF personnel, as specified in the *ICDF Complex Waste Verzjcation Sampling and Analysis Plan* (DOE-ID 2003d), to confirm that key parameters (identified in the verification SAP) in the waste do not exceed the limits on the material profile. Key parameters are those identified as impacting ICDF operations or limiting acceptance of waste in the landfill, as defined by the ICDF WAC and/or operational limits. Waste verification can include visual inspection of the waste, administrative controls, documentation and calculation reviews, or verification sample collection. Where possible, ICDF waste verification activities will be coordinated with the sampling effort described in this FSP.

Regulatory limits on radionuclide activity that can be disposed in the ICDF Landfill are invoked by the OU 1-10 ROD and DOE Order 435.1, as discussed in the WAC for the ICDF Landfill (DOE-ID 2002c).

2. SITE BACKGROUND

The INEEL, a government-owned facility managed by the Department of Energy (DOE), is located in southeastern Idaho, 51.5-km (32-miles) west of Idaho Falls, as shown in Figure 2-1. The INEEL encompasses approximately 2,305 km^2 (890 mi^2) of the northwestern portion of the eastern Snake River Plain, and extends into portions of five Idaho counties.

In November 1989, because of confirmed contaminant releases to the environment, the Environmental Protection Agency (EPA) placed the INEEL on the National Priorities List of the *National Oil and Hazardous Substances Contingency Plan* (54 Federal Register [FR] 48184). In response to this listing, the DOE, EPA, and the Idaho Department of Environmental Quality (IDEQ), (herein referred to as the Agencies) negotiated the FFA/CO and Action Plan. The Agencies signed these documents in 1991, establishing the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA, RCRA, and the Idaho HWMA.

To better manage cleanup activities, the INEEL was divided into 10 WAGs. Test Area North, shown in Figure 2-2, is designated as WAG 1 and includes fenced areas and areas immediately outside the fence lines at the TSF, the Initial Engine Test (IET) Facility, the Loss-of-Fluid Test (LOFT) Facility and Specific Manufacturing Capability (SMC) Facility, and the Water Reactor Research Test Facility (WRRTF) (DOE-ID 1999). Since its construction in 1954, TAN has supported numerous research and testing projects, including development and testing of designs for nuclear-powered aircraft engines, reactor safety testing and behavior studies, armor manufacturing, nuclear inspections, and storage operations.

The FFA/CO established ten OUs within WAG 1 consisting of 94 potential release sites (DOE-ID 1999). The sites include various types of pits, spill sites, ponds, aboveground and underground storage tanks (USTs), and a railroad turntable. A comprehensive remedial investigation/feasibility study (RI/FS) was initiated in 1995 to determine the nature and extent of the contamination at TAN under OU 1-10, defined in the FFA/CO as the *WAG 1 Comprehensive Remedial Investigation/Feasibility Study* (DOE-ID 1997). The OU 1-10 RI/FS culminated with the finalization of the OU 1-10 ROD (DOE-ID 1999), which provides information to support RAs for eight sites where contaminants present an unacceptable risk to human health and the environment.

Final remediation goals were established for each site to ensure risk-based protection of human health and the environment by providing for unrestricted land use in 100 years. These goals, which are both contaminant- and site-specific, are quantitative cleanup levels based primarily on applicable or relevant and appropriate requirements (ARARs) and risk-based doses. The only FRG identified in Table 6-1 of the ROD for TSF-26 PM-2A tanks is Cs-137 at 23.3 pCi/g. Cesium-137 will be used as an indicator of potential contamination.

2.1 PM-2A Tanks Site

The TAN OU 1-10 TSF-26 Site was subdivided for remediation purposes. Site TSF-26 surface soils, included in Group 1, are assumed to extend 10 ft below ground surface (bgs) above the PM-2A Tanks. The remaining soil above the tanks, the tanks themselves, the cradles and ancillary piping are considered the PM-2A tanks site within Group 3. Specifically, the PM-2A tanks site consists of two abandoned 189,270-L (50,000-gal) USTs, their concrete cradles (containment troughs), certain associated piping, the waste content of the tanks, and the contaminated surface soils around them (Figure 2-3).

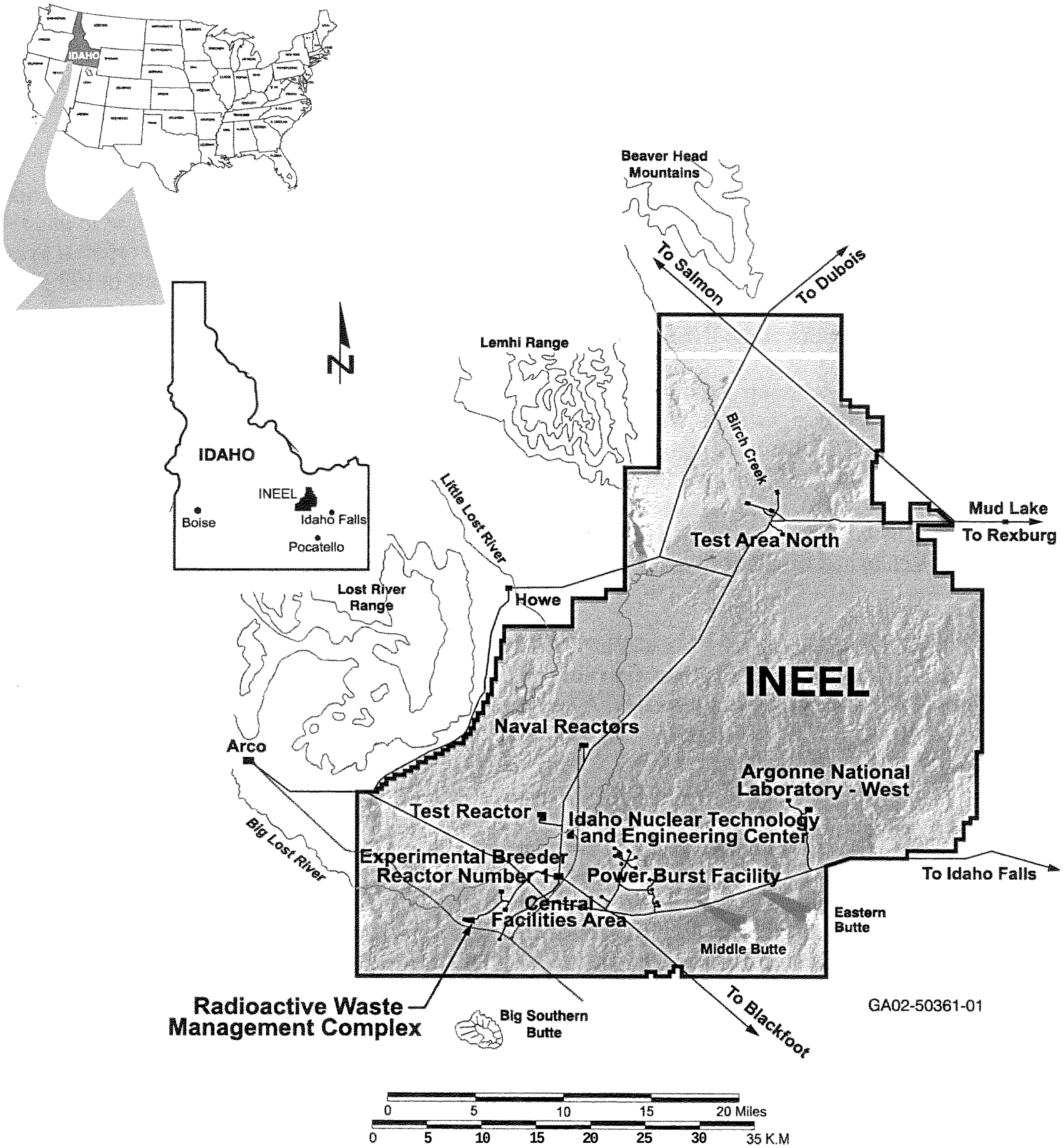

Figure 2-1. Location of the INEEL.

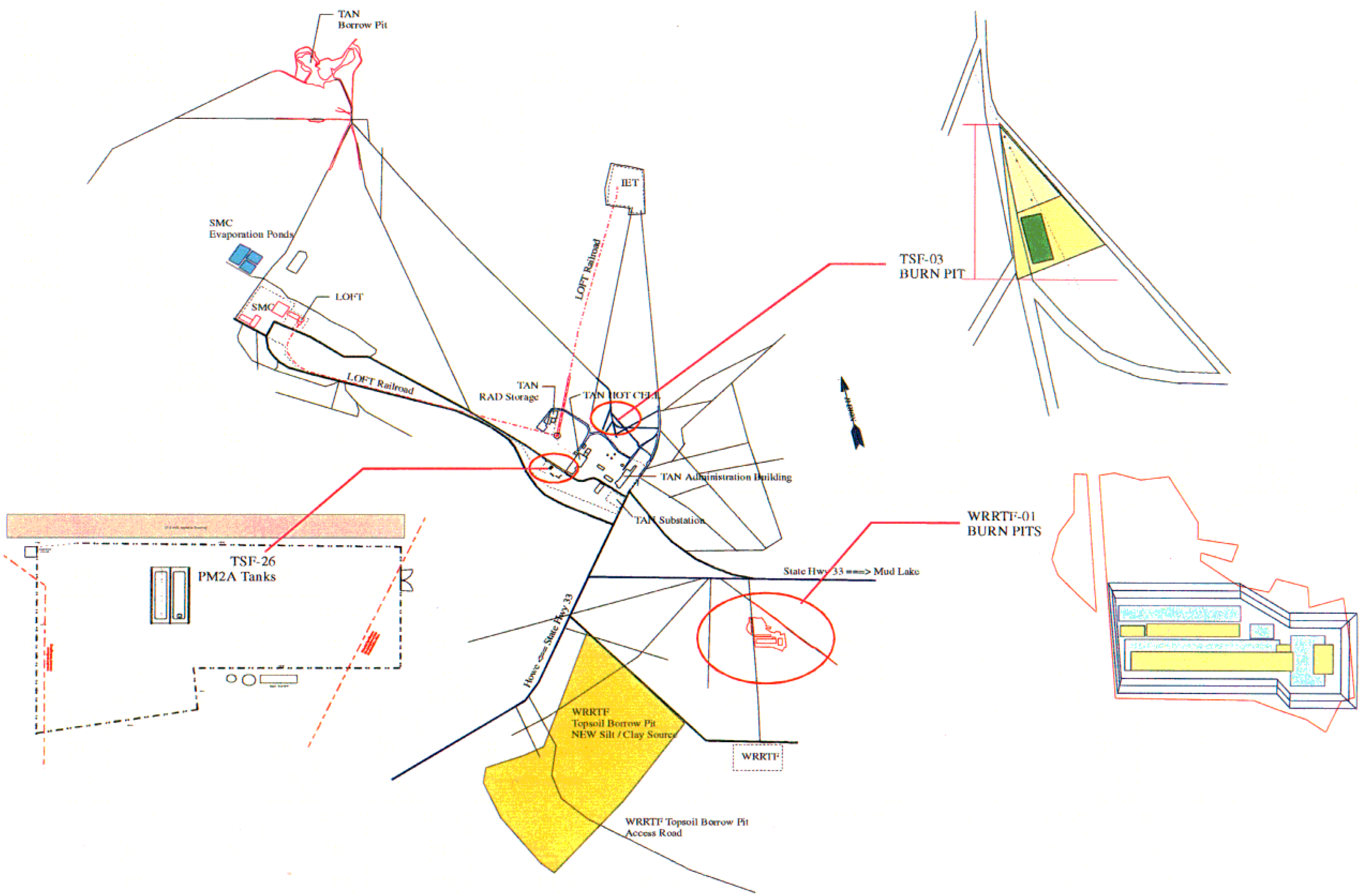

Figure 2-2. WAG 1 Test Area North Facilities.

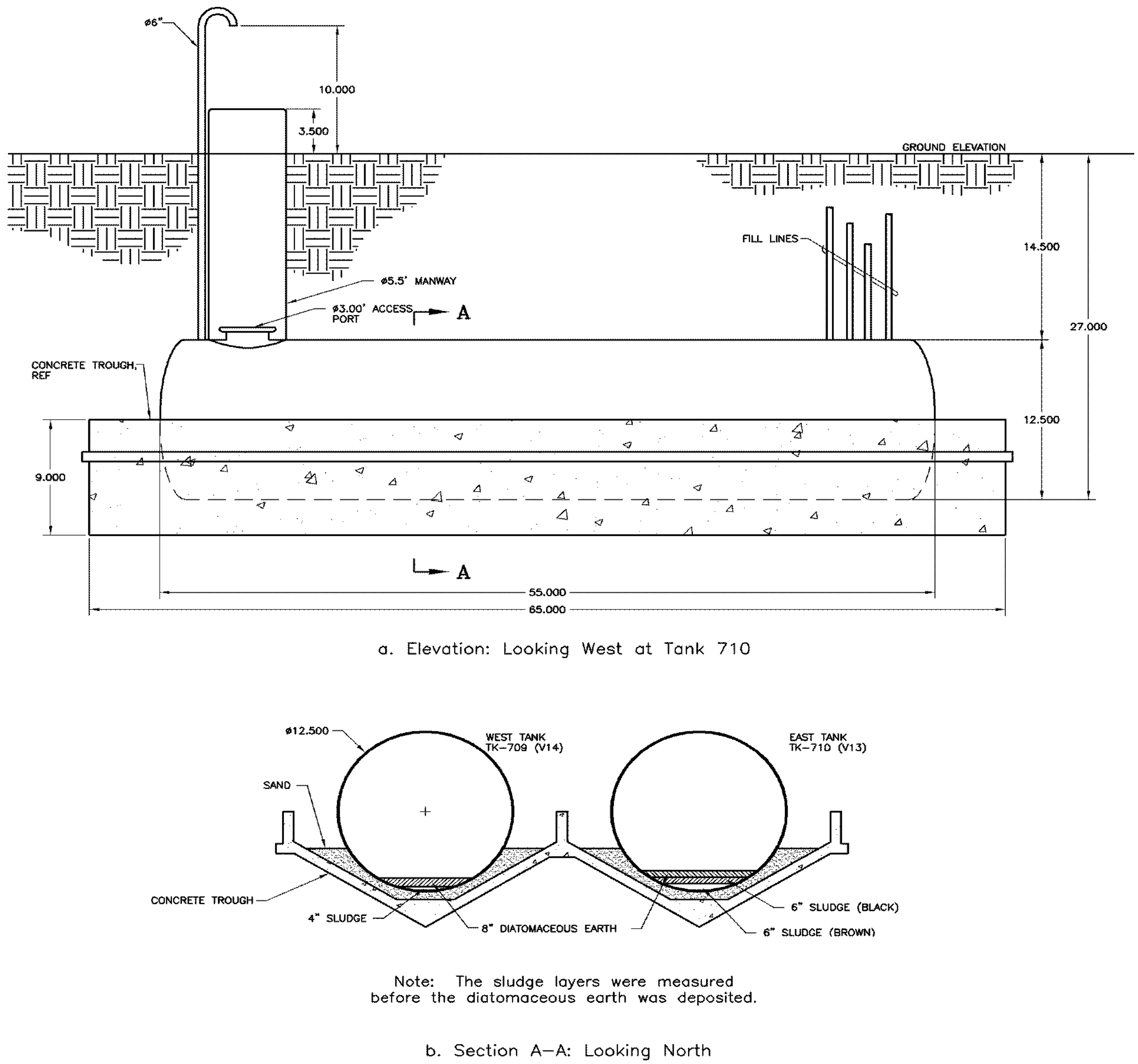

Figure 2-3. PM-2A Tanks site.

The tanks, designated as V-13 and V-14, were installed in the mid-1950s to store low-level radioactive waste from the TAN Evaporator and the PM-2A Temporary Evaporator until the early 1980s, when the PM-2A Evaporator was decontaminated and decommissioned. The tanks currently contain FOO 1-listed, hazardous sludge contaminated with radionuclides, heavy metals, organic compounds, and polychlorinated biphenyls (PCBs). The tanks were filled with diatomaceous earth during the decontamination and decommissioning (D&D) activities to absorb free liquid. However, a recent video of the tank interiors by Bechtel BWXT Idaho, LLC (BBWI) shows some liquid in V-14 (the west tank). The soil above and in the general area of the tanks was contaminated from occasional spills during routine operations, and from leaks and spills during the removal and treatment of the liquid waste.

2.2 Previous Investigations

During operations, the PM-2A Tanks area was surveyed for radiological contamination due to the leaks and spills, and several inches of gravel were placed over the contaminated soil to reduce the radiation field. In 1982, D&D of the PM-2A System was conducted. Most of the liquids in the PM-2A Tanks were pumped out into concrete containers, mixed with cement, and shipped to the Radioactive Waste Management Complex (RWMC) for burial. As described above, diatomaceous earth material was added to the tanks to absorb the remaining free liquid (DOE-ID 1997). The PM-2A System included a 1,100 ft run of two parallel 4-in. outside-diameter pipes that originated at TAN-616 and ultimately discharged to V-13 and V-14. These concentrate discharge lines, containing several elbows, were routed through the TSF-06, Area B, under Snake Avenue, and into the PM-2A Tanks area. The pipes remain in place but were cut and capped just north of Snake Avenue during the D&D effort to prevent liquids from getting into the underground tanks (EG&G 1983).

During the 1982 D&D effort, the most contaminated surface soil within the PM-2A boundaries (northeast corner) was removed, boxed into a total of 104, 2 x 4 x 8-ft waste boxes, and transported to the RWMC for burial. Unexpected contaminated sludge was discovered during the earth moving. The sludge, buried about 3 ft deep in one location, was excavated, placed into three boxes, and shipped to RWMC for burial with the other contaminated soil boxes.

Following removal of the soil and sludge in 1982, the PM-2A area was graded and the surface was radiologically surveyed. When the survey showed elevated radiological activity, the entire PM-2A area was backfilled with clean soil. Approximately 20,000 ft^3 of gravelly soil, followed by 10,000 ft^3 of topsoil were hauled in, smoothed, and graded. The PM-2A area was fenced with a 6-ft high chain link fence, and a 20-ft wide gate was installed along the east end of the area. Four concrete and brass markers were placed to designate the four corners of the concrete cradle in which the underground tanks reside. Manways to the underground tanks were covered to prevent the entrance of snow. Currently, a drainage ditch vegetated by sagebrush and planted crested wheat grass traverses the area in an east-west direction south of the PM-2A tanks.

The soils surrounding the PM-2A Tanks were evaluated in 1988 during a DOE environmental survey. Four borings were drilled near the PM-2A Tanks, and radiological analyses were performed, which showed levels of Cs-137 contamination (1.7 to 120 pCi/g) in the soil to at least 5.2 m (17 ft) bgs (DOE-ID 1997).

In 1993, a Track 2 investigation was performed at the TSF-26 Site (INEEL 1994). The Track 2 investigation included a high-resolution magnetic field survey to determine the location of buried metallic objects, including the USTs and sandpoints. Sandpoints are small diameter, steel-cased monitoring points that extend into the bedding material for the USTs within the concrete cradle. The sandpoints were sampled and analyzed. One deep and three shallow borings were completed and sampled, and grab samples from the surface were also collected. Radiological analyses performed on the surface samples indicated elevated gross beta and gamma activities. Organic analyses for semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and PCBs were conducted on the samples from the three shallow borings. No VOCs, SVOCs, or PCBs were detected in any of the soil samples from the Track 2 investigation (DOE-ID 1997). A composite sample, composed of cuttings from the surface to 9 m (30 ft) bgs, was collected and analyzed for gross beta activity, gross alpha activity, gamma activities, six Contract Laboratory Program (CLP) metals, CLP VOCs, CLP SVOCs, and PCBs. The results indicated elevated gross beta and gamma activities in composite deep bore drill cuttings; no VOCs, SVOCs, RCRA-regulated metals or PCBs were detected in any of the soil samples.

Based on the results of the Track 2 investigation, a non-time-critical removal action under OU 10-06 was performed at TSF-26 in 1995, during which contaminated soil above a 15 pCi/g field screening action level was removed from TSF-26 (DOE-ID 1996). Three soil stockpiles with gamma radiation readings greater than that allowed for disposal by the project work control documentation were left at the TSF-26 Site. Additionally, a wooden box was discovered near the PM-2A tanks, but no information was available regarding its contents. Therefore, it was not opened or investigated at the time of the removal action, but left in place. Also encountered in the TSF-26 area was scattered debris concentrated along the northern perimeter fence. The debris included concrete, a galvanized steel culvert, railroad ties, wooden pallets, plywood, steel conduit, and an old electric motor. The debris was left in place. Sampling following the removal action indicated an area 30.5 m x 21.3 m (100 ft x 70 ft) to 5.2 m (17 ft) bgs contaminated with Cs-137 (DOE-ID 1999).

In 1998, six sampling locations were selected to characterize the soils at the PM-2A tanks site. At each location, samples were collected with a split spoon sampler from three depth intervals: 0 to 0.8 m (0 to 2.5 ft), 1.5 to 2.3 m (5 to 7.5 ft), and 2.3 to 3 m (7.5 to 10 ft). These samples were then analyzed for CLP VOCs, toxicity characteristic leaching procedure (TCLP) VOCs, PCBs, and TCLP metals. No VOCs, PCBs, or TCLP metals were detected above regulatory levels.

In March 2000, the three soil stockpiles and the wooden box were sampled to obtain additional data to support remediation, obtain a no-longer-contained-in (NLCI) determination for the soils, and provide necessary concentration data to proceed with the Group 1 RA. The samples of the soil stockpiles and wooden box were collected in accordance with the post-ROD FSP (DOE-ID 2000). Samples were analyzed for VOCs, SVOCs, PCBs, total metals, TCLP metals, and radionuclides. Gross alpha and beta results were also obtained to provide information for the future disposal of these soils. Data results revealed non-detects for SVOCs and PCBs; some VOCs were detected at insignificant levels (INEEL 2002). Radionuclide results showed Cs-137 concentrations up to 3,600 pCi/g in the soil stockpiles, which was similar to the 4,400 pCi/g maximum sample result obtained during the OU 10-06 removal action, as documented in the RI/FS. Radionuclide sample results for the wooden box were significantly higher than the results for the soil stockpiles. The maximum Cs-137 concentration was 710,000 pCi/g from one sample location, suggesting that the wooden box served as some type of container for soil with elevated concentration levels.

Following sampling and analyses, fieldwork began to containerize the soil stockpiles and wooden box material into soft-sided bags. The wooden box was excavated with a backhoe; the soil was placed into separate soil bags. An estimated total excavated volume of 144 yd^3 from the TSF-26 soil stockpiles and wooden box filled a total of 22 soil bags. These were stacked in the southwest portion of the TSF-26 site and later transported to the Radioactive Parts Security Storage Area for interim storage. Following completion of follow-up sampling and remediation activities (winterization and decontamination of equipment), and receipt of a NLCI determination from the IDEQ, the containerized soil was transported to the RWMC for disposal by December 2000.

In August 2000, radiological sampling for TSF-26 was performed to obtain data regarding the vertical nature and extent of contamination to support future RA (INEEL 2002). Samples were collected at 6-in., 12-in., and 18-in. intervals throughout the TSF-26 Site at pre-established grid locations. The results indicate Cs-137 concentrations above 23.3 pCi/g in surface samples only (0-6 in.).

During the spring of 2003, soil sampling was conducted for the OU 1-10 Group 1 Sites TSF-06 (Soil Contamination Area South of the Turntable) and TSF-26 to obtain additional data to support and direct the selected remedies for these sites as identified in the OU 1-10 ROD. Soil samples were collected alongside the PM-2A Tanks cradles down to basalt and from the bedding material within the cradles. Samples were collected for metals, SVOCs, VOCs, PCBs, and radionuclide analyses. The sampling results confirm that the contamination present is likely from surface spills or releases with the contaminatino concentration decreasing with depth. Samples collected near the bottom of the tanks indicate that the soils beneath the tanks and the soils surrounding, within, and beneath the concrete cradles are not significantly contaminated. Most of the samples taken at the tank level or lower showed contaminant concentrations close to background levels. These samples showed Cs-137 concentrations less than the FRG of 23.3 pCi/g.

In addition to this soil sampling, the contents from both of the PM-2A tanks (Tanks V-13 and V-14) were sampled in the summer of 2003 for characterization and disposal information. These samples were analyzed for metals, VOCs, SVOCs, PCBs, miscellaneous analyses (total halogens, reactive sulfides, cyanides, and fluorides, and pH), radioactive and toxicity characterization leaching procedure analyses (for metals, VOCs, SVOCs, herbicides, and pesticides). This data has not yet been validated.

3. PROJECT ORGANIZATION AND RESPONSIBILITIES

A clearly defined project organization is essential to ensure that the project remediation objectives are achieved and that data collection, reporting, evaluation, and interpretation requirements are met. The following sections outline the specific responsibilities of key site personnel.

3.1 Key Personnel Responsibilities

Responsibilities for key personnel associated with the field activities described in this FSP are outlined in the following sections.

3.1.1 Project Manager

The WAG 1 project manager (PM) will ensure that all activities conducted during the project comply with INEEL MCPs, program requirements documents (PRDs), and all applicable Occupational Safety and Health Administration (OSHA), EPA, DOE, **U.S.** Department of Transportation (DOT) and State of Idaho requirements. The PM coordinates all document preparation and all field, laboratory, data evaluation, risk assessment, dose assessment, and closure design activities. The WAG 1 PM is responsible for the overall work scope, schedule, and budget.

3.1.2 Field Team Leader

The field team leader (FTL) will be delegated responsibility for the safe and successful completion of the sampling activities outlined in this FSP. The FTL works with the environment, safety, health, and quality (ESH&Q) oversight personnel, and the field team to manage field sampling related operations and to execute this FSP. The FTL enforces site control, documents activities, and conducts the daily safety briefings at the start of each shift. Health and safety issues may be brought to the attention of the FTL by any team member.

The FTL serves as the representative for the ER Program at the site. The FTL is responsible for field activities, crafts personnel, and other personnel assigned to work at the site. The FTL will serve as the interface between facility operations and project personnel and will work closely with the sampling team at the site to ensure that the objectives of the project are accomplished in a safe and efficient manner. The FTL will work with all other identified project personnel to accomplish day-to-day operations at the site, identify and obtain additional resources needed at the site, and interact with the ESH&Q oversight personnel on matters regarding health and safety. The FTL will conduct all daily pre-job briefings and ensure that the work package is signed daily.

3.1.3 ESH&Q Oversight

The ESH&Q oversight personnel are the primary source for information regarding hazardous and toxic agents at the site. The ESH&Q oversight personnel assess the potential for worker exposures to hazardous agents according to the INEEL Safety and Health Manual, MCPs, PRDs, and accepted industrial hygiene (IH) practices and protocol. The ESH&Q oversight personnel will assure that all work is performed in accordance with INEEL MCP-3562 and STD-101. By participating in site characterization, ESH&Q oversight personnel assess and recommend appropriate hazard controls for the protection of site personnel, and operate and maintain airborne sampling and monitoring equipment, as appropriate. The ESH&Q oversight personnel also recommend and assess the use of personal protective equipment (PPE) in the project health and safety plan (HASP) or other health and safety documentation such as safe work permits or radiological work permits.

In the event of an evacuation, the ESH&Q oversight personnel, in conjunction with other recovery team members, will assist the PM in determining whether conditions exist for safe site reentry. Personnel showing symptoms of health effects resulting from possible exposure to hazardous agents will be referred to an occupational medical program physician by their supervisor or by ESH&Q oversight personnel. The ESH&Q oversight personnel may have other duties at the site, as specified in other sections of the HASP, PRDs, and/or MCPs. During emergencies involving hazardous materials, airborne sampling and monitoring will be coordinated with members of the Emergency Response Organization.

3.1.4 Waste Generator Services

The INEEL Waste Generator Services (WGS) waste technical specialist will ensure that disposition of waste material is in compliance with identified guidance. The WGS personnel have the responsibility to help solve waste management issues at the task site. Personnel also prepare the appropriate documentation for waste disposal and make the proper notifications, as required. All wastes will be managed and disposed according to the project waste management plan (WMP) (INEEL 2003a).

3.1.5 Radiological Control

Radiological control personnel will be involved with all aspects of the project where radiation exposure is of concern. To monitor the work environment for field personnel and to ensure the safety of laboratory personnel at INEEL laboratories, all activities will comply with BBWI MCPs. The radiological controls and personnel monitoring requirements established for this sampling effort in the project HASP (INEEL 2003b) are based on personnel dose received and radiological survey data collected during past work activities at the site. These data will be used to implement action levels (ALs) that will help ensure that all work activities and personnel exposure to direct radiation are maintained as low as reasonably achievable.

3.1.6 Sampling Team Members

The sampling team will consist of sampling personnel who are fully trained and skilled in the standard sampling procedures for sampling soils as well as decontamination procedures, and ESH&Q oversight personnel. All sampling team personnel will have qualifications in compliance with the project-specific training matrix. At the end of each sampling effort, the sampling team, under direct supervision of ESH&Q oversight personnel, will be responsible for removal and transport of any sampling equipment brought into the sampling area to a decontamination area. Waste management will be performed in accordance with the provisions outlined in the project specific WMP (INEEL 2003a).

Sampling team members will be trained to procedures for collection of representative sample and trained to the many TAN and INEEL environmental safety and health procedures and policies. Senior personnel will also be familiar with the tank system and its components. Each member of the sampling team, in compliance with the project-specific training matrix and as outlined in the HASP, will have up-to-date training relating to site hazards, including OSHA hazardous waste site worker training, radiation worker training, and other training deemed applicable by the PM, FTL, and the health and safety organization.

3.2 Non-Field Team Members/Visitors

All persons on the work site who are not part of the field team (e.g., surveyor, equipment operator, or other craft personnel not assigned to the project) are considered non-field team members or visitors for the purposes of this project. A person will be considered "on-site" when they are present in or beyond the designated support zone. Per 29 Code of Federal Regulations (CFR) 1910.120/1926.65, non-field team members are considered occasional site workers and must comply with the following requirements:

- Receive any additional site-specific training identified in the project HASP prior to entering beyond the support zone of the project site

- Meet all required training for the tasks being performed, as identified in the project HASP

- Meet minimum training requirements for such workers as described in the OSHA standard

- Meet the same training requirements as the workers if the non-worker's tasks require entry into the work control zone.

Training must be documented and a copy of the documentation must be incorporated into the project field file. A site supervisor (e.g., health and safety officer [HSO] or FTL) will supervise all non-field team personnel who have not completed their 3 days of supervised field experience, in accordance with the Hazardous Waste Operations (HAZWOPER) standard. Non-field team members/visitors may not be allowed beyond the support zone during certain project site tasks (e.g., drilling) to minimize safety and health hazards. The determination of any visitor's "need" for access beyond the support zone at the project site will be made by the HSO in consultation with TAN Radiological Control (RadCon) personnel (as appropriate).

3.3 Points of Contact

Table 3-1 lists the key points of contact for the TAN, WAG 1, OU 1-10 field activities for the PM-2A tanks site. The personnel listed in the table are those persons to be contacted as a part of sampling operations. This table is subject to change due to reassignment of personnel. A current copy of this table will be posted at the job site for reference during all project activities. Revisions to this table will not require a document action request because the current job positions will be posted at the job site.

Table 3-1. PM-2A Tanks site points of contact.

Name	Title	Telephone Number
Jim Bruce	WAG 1 Project Manager	526-4370
Dave Eaton	WAG 1 Regulatory Support	526-7002
Gary McDannel	WAG 1 Project Engineer	526-5076
Jim Bruce	OU 1-10 RD/RA Project Manager	526-4370
Mark Langlois	Health and Safety Officer	526-2160
Mark Elliot	Field Team Leader	526-0872
Todd Lewis	Industrial Hygienist	526-6856
Steve Gamache	Safety Engineer	526-2807
Bruce Hendrix	Fire Protection Engineer	526-7989
Gary Lusk	Radiological Control Technician	526-4165
John Harris/Marshall Marlor	Waste Generator Services Contact	526-3461/526-2581
Bob Miklos	TAN Facilities Manager	526-4072
James Rider	QA Engineer	526-2534
Rod Remsburg	Construction Coordinator	526-3398

4. QUALITY OBJECTIVES

The following sections outline the objectives of the sampling activities described in this FSP. Data quality objectives are developed and discussed in detail.

4.1 Data Quality Objectives

The DQO process, which is used to specify, qualitatively and quantitatively, the objectives for the data collected, was designed as a specific planning tool to establish criteria for defensible decision making and to facilitate the design of the data acquisition efforts. The DQO process is described in the EPA document, *Data Quality Objectives Process for Hazardous Waste Site Investigations* (EPA 2000). The DQO process includes seven steps, each of which has specific outputs. Each of the following subsections corresponds to a section in the DQO process, and provides the output for each step.

4.1.1 Problem Statement

The first step in the DQO process is to use relevant information to clearly and concisely state the problem to be resolved. Its intent is to define the problem so that the focus of the sampling and analysis will be unambiguous.

The problem statement is as follows: Confirmation sampling is required to verify that residual concentrations of Cs-137 do not exceed the CERCLA FRG for the PM-2A tanks site following completion of the RA. If residual Cs-137 concentrations exceed the CERCLA FRG, additional RAs (i.e., soil removal) will be taken, under the provisions of the FFA/CO, to ensure that the FRG is met. Once the samples specified in this FSP have been collected and analyzed, the information will be documented in the RA Report.

4.1.2 Principal Study Questions and Decision Statements

This step in the DQO process identifies the decisions and actions that will be taken based on the data collected. The study questions and their corresponding alternative actions (AAs) will then be joined to form decision statements (DSs).

The objective of the soil sampling specified in this FSP (to verify compliance with CERCLA FRG), is to answer the following principal study question (PSQ):

- PSQ1: Are residual concentrations of Cs-137 in the soils following removal of the tanks for which a CERCLA FRG has been established less than the associated CERCLA FRG?

  The AAs to be taken depending on the resolution to PSQl are as follows:

  - AA1.1: If the residual concentrations of Cs-137 for which a CERCLA FRG has been established are less than the associated CERCLA FRG, then no further action is required for the soils

  - AA1.2: If the residual concentrations of Cs-137 for which a CERCLA FRG has been established are <u>not</u> less than the associated CERCLA FRG, then subsequent remedial actions will be evaluated under the FFA/CO.

Combining PSQ1 and the associated AAs results in the following DS:

- DS1: Determine whether or not the residual concentrations of Cs-137 in the soils following removal of the tanks for which a CERCLA FRG has been established are less than the associated CERCLA FRG or whether subsequent remedial actions are required under the provisions of the FFA/CO.

4.1.3 Decision Inputs

The purpose of this step is to identify informational inputs that will be required to resolve the DS and to determine which inputs require measurements.

The information required to resolve DS 1 is the identification and quantification of Cs-137 remaining in the soils following removal of the tanks.

4.1.4 Study Boundaries

The primary objectives of this step are to identify the population of interest, define the spatial and temporal boundaries that apply to the DS, define the scale of decision-making, and identify practical constraints that must be considered in the sampling design. Implementing this step helps ensure that the sampling design will result in the collection of data that accurately reflect the true condition of the site under investigation.

The spatial boundaries of concern for this sampling effort are confined to soil areas associated with the PM-2A tanks. The boundaries of the PM-2A tanks site include the soil immediately above and adjacent to the tanks, but exclude the surface soil above the tanks. The surface soil removal is part of Group 1 activities for OU 1-10, Site TSF-26, and per the ROD, extends from the surface of the site to 10 ft bgs above the tanks. Approximately 5 ft of the surface soil has been removed during previous activities, and BBWI intends to remove another 1 ft, leaving approximately 4 ft of Group 1 soils above the tanks that will be handled under the Group 3 remediation. These boundaries will be further defined based on field conditions following excavation and removal of the tanks, ancillary piping, and associated soil.

The temporal boundary refers to both the timeframe over which each DS applies (e.g., number of years) and when the data should optimally be collected (e.g., season, time of day, and weather conditions). No practical constraints are expected to be encountered that would interfere with the performance of the sampling outlined in this FSP. Since the tanks will be removed, no physical interferences to sampling are expected.

4.1.5 Decision Rules

The objective of this step is to define parameters of interest that characterize the population, specify the action level, and integrate previous DQO outputs into a single statement that defines the conditions that would cause the decision maker to choose among AAs. The decision rule typically takes the form of an ***"If...then"*** statement describing the action to take if one or more conditions are met.

The decision rule is specified in relation to a parameter that characterizes the population of interest. The parameter of interest for the radiological soil samples will be the true mean concentration, as estimated by the 95% upper confidence limit (UCL) of the sample mean. Therefore, the sample statistic of interest for the soils will be the 95% UCL of the radiological sample mean concentration.

The decision rules originating from the FFA/CO are:

- ***If*** the true mean concentrations of Cs-137 for which a CERCLA FRG has been established, as estimated by the 95% UCL of the sample means, detected in analyses of radiological soil samples collected following tank removal are less than the associated CERCLA FRG, ***then*** no subsequent remediation activities will be required under the provisions of the FFA/CO

- ***If*** the true mean concentrations of Cs-137 for which a CERCLA FRG has been established, as estimated by the 95% UCL of the sample means, detected in analyses of radiological soil samples collected following tank removal is greater than the associated CERCLA FRG, ***then*** subsequent remediation activities will be evaluated under the provisions of the FFA/CO.

4.1.6 Decision Error Limits

Since analytical data can only estimate the true condition of the site under investigation, decisions based on measurement data could potentially be in error. For this reason, the primary objective of this step is to minimize data uncertainty by specifying tolerable limits on decision errors that are used to establish performance goals for the data collection design.

Because decisions are based on measurement data, which provide only an estimate of the true state of the media being characterized, decisions based on that data could be in error. Tolerable limits on the probability of making a decision error must be defined. The probability of decision errors can be controlled by using the data to select between one condition of the environment (i.e., soil) and the alternative condition. One condition is assumed to be the baseline condition and is referred to as the *null hypothesis* (Ho). The alternative condition is the *alternative hypothesis* (H»). The null hypothesis is presumed to be true in the absence of strong evidence to the contrary, which allows decision-makers to guard against making the decision error with the most undesirable consequences.

A decision error occurs when the decision-maker rejects the null hypothesis when it is true, or fails to reject the null hypothesis when it is false. These two types of decision errors are classified as *false positive* and *false negative* decision errors, respectively. False positive and false negative errors are defined in terms of the definition of the null and alternative hypotheses. For example, a decision-maker presumes a certain waste is hazardous (i.e., the null hypothesis is "the waste is hazardous"). If the data causes the decision-maker to conclude that the waste is not hazardous when it truly is hazardous, then the decision-maker would make a false positive decision error. Statisticians refer to this error as a Type I error. The measure of the size of this error is called alpha (α), the level of significance, or the size of the critical region. If, however, the data causes the decision-maker to conclude that the waste is hazardous when, in fact, it is not, then the decision-maker would make a false negative decision error. Statisticians refer to this error as a Type II error. The measure of the size of this error is called beta (β), and is also known as the compliment of the power of a hypothesis test.

The possibility of decision error cannot be eliminated but it can be minimized, which is accomplished by controlling the total study error. Methods for controlling total study error include collecting a large number of samples (to control sampling design error), analyzing individual samples several times, or using more precise analytical methods (to control measurement error). The chosen method for reducing decision errors depends on where the greatest component of total study error exists in the data set and the ease in reducing the error contributed by those data components. The amount of effort expended on controlling decision error is directly proportional to the consequences of making an error.

The decision error that has the more severe consequences as the true concentrations of the parameters of interest approach the AL, must be specified, as it is the basis for establishing the null hypothesis. This decision error is used because as the parameters approach the AL, the data are much more likely to lead to an incorrect decision than when the parameters are far above or below the AL. For regulatory compliance, human health, or environmental risk issues, the decision error that has the most adverse consequences will be favored as the null hypothesis. In statistical hypothesis testing, the data must conclusively demonstrate that the null hypothesis is false. Therefore, setting the null hypothesis to the condition that exists when the most adverse decision error occurs guards against making that decision error by placing the burden of proof on demonstrating that the most adverse consequences will not be likely to occur.

For DS1, the null hypothesis is that the concentrations of Cs-137 will be assumed to be in excess of the CERCLA FRG.

A range of possible parameter values must be specified where the consequences of decision errors are relatively minor. This range of values is referred to as the “gray region,” which is bounded on one side by the AL and on the other side by the parameter value where making a false negative decision error begins to be significant (U). It is necessary to specify the gray region because the variability in the sample population and unavoidable imprecision in the measurement system combine to produce variability in the data such that a decision may be “too close to call” when the true parameter value is very close to the AL. In statistics, this interval is called the “minimum detectable difference” and is expressed as delta **(A).** The width of this gray region is critical in calculating the number of samples needed to satisfy the DQOs. A narrow gray region indicates a desire to detect conclusively the condition when the true parameter value is close to the AL.

The final activity required in specifying the tolerable limits on decision error is to assign values to the gray region that reflect the probability of decision errors occurring. These probability values are the decision-maker’s tolerable limits for making an incorrect decision. These values are determined by selecting a possible true value for the parameter of interest, then choosing a probability limit based on an evaluation of the seriousness of the potential consequences of making a decision error if the true parameter value is located at that point.

The project team must determine the three variables (width of gray region, acceptable false positive decision error value when the true mean concentration is equal to the AL, and acceptable false negative decision error value when the true mean concentration is equal to U) and adjust them to acceptable tolerances. Then, using the values and an estimate of the variability of the population (σ^2), the number of samples required to satisfy the DQOs can be determined. The sample collection design for the PM-2A tanks sampling activities is discussed in the following section. An acceptable false positive decision error value of 0.05 (when the true mean concentration is equal to the AL) and an acceptable false negative decision error value of 0.20 (when the true mean concentration is equal to U) have been selected for this sampling design.

4.1.7 Design Optimization

The objective of this step is to identify the sampling and analysis design that best satisfies the previous DQO Steps 1 through 6. The activities required to optimize the design include:

- Reviewing the outputs of the first six steps and existing environmental data

- Developing general data collection design alternatives

- Formulating a mathematical expression needed to solve the design problem for each data collection design alternative

- Selecting the optimal number of samples to satisfy the DQOs for each data collection design alternative

- Selecting the most resource-effective data collection design that satisfies all the DQOs.

The outputs of the first six steps have been discussed previously. There is existing environmental data relevant to the TSF-26 soil in the area surrounding the tanks, as well as historical operations data regarding tank contents. In the spring of 2003, BBWI sampled the soil alongside the cradles down to basalt and the bedding material within the cradles. The data indicate no Cs-137 concentrations >23.3 pCi/g in any of the samples collected. Based on these results, it is assumed that the cradles will not require removal.

Once the tanks, associated piping, and associated soil have been removed, confiiation sampling will be conducted to verify that all contamination exceeding the 23.3 pCi/g FRG for **Cs-137** has been removed.

During tank removal, the tanks and the area immediately adjacent to the tanks will be visually evaluated for evidence of contaminant release as specified in the HWMA/RCRA Closure Plan. If there is evidence of a release, the sand and cradles will be removed and the Closure Plan FSP implemented to sample the soil beneath the cradles for RCRA constituents. This PM-2A FSP will be implemented to perform confiition sampling in the excavated areas after the Closure Plan requirements have been met. A systematic random sampling approach for the soil will be used to determine radiological sampling locations within the excavated area. With this approach, a grid is used to divide the sampling area into potential sampling locations, and a starting point is randomly selected. A random number generator is used to determine the remainder of the grid locations.

When using a simple or composite random sampling approach, there are commonly accepted mathematical expressions (e.g., the Student's *t* distribution) to solve design problems for these data collection design alternatives (EPA **1989).** The formula for determining the number of samples to be collected is selected based on the hypothesis test and data collection design. In this case, the hypothesis test will be a one-sample Student's *t* distribution of the mean versus action level. Using this hypothesis test, the formula shown below is used for computing the number of samples required for a simple random sampling approach:

$$n = \frac{\sigma^2 \left(Z_{1-\beta} + Z_{1-\alpha}\right)^2}{\Delta^2} + (.5)Z_{1-\alpha}{}^2 \qquad \textbf{(4-1)}$$

where

σ^2	=	estimated variance in measurements
n	=	number of samples required
z	=	the p[th] percentile of the standard normal distribution (from statistical tables)
A	=	AL - U (the minimum detectable difference)

U = parameter value where making a false negative decision error begins to be significant

AL = actionlevel.

Although it is generally assumed that the variability of the sampled soil matrix will be relatively high since homogeneity of the soil cannot be assumed, it is appropriate to apply a mid-range coefficient of variance (σ) to determine the number of samples required because the spatial extent of the area is relatively small. The radiological soil sample locations for the PM-2A **Tanks** area will be developed by applying a systematic random sampling design to sample soils at specified intervals within a grid established within the excavated area. Using a concentration that is 20% of the AL as σ, and assuming an acceptable chance of false positive decision error to be 5% when the true concentration is equal to the AL, an acceptable chance of false negative decision error to be 20% when the true concentration is equal to U, and the width of the gray region is 20% of the AL, the following equation shows the solution for n using the project-specific variables. The values for 1-a and 1-β where obtained from EPA guidance (EPA 1989).

$$n = \frac{20^2(.842 + 1.645)^2}{20^2} + (.5)(1.645)^2 = 7.5 = 8 \qquad (4\text{-}2)$$

Therefore, a minimum of eight locations will be sampled. Figure 4-1 indicates proposed sample locations. Samples will be collected and submitted for a 20-minute gamma spectrometric analysis to evaluate Cs-137 concentrations in the soil, using field calibrated high-purity germanium (HPGe) portable in situ gamma spectroscopy onsite. In addition, a sodium iodide (NaI) portable scintillometer will be used to scan the bottom of the excavation to identify any hot spots. Based on this screening, additional bias samples may be collected during sampling activities, as described in Section 5.2.

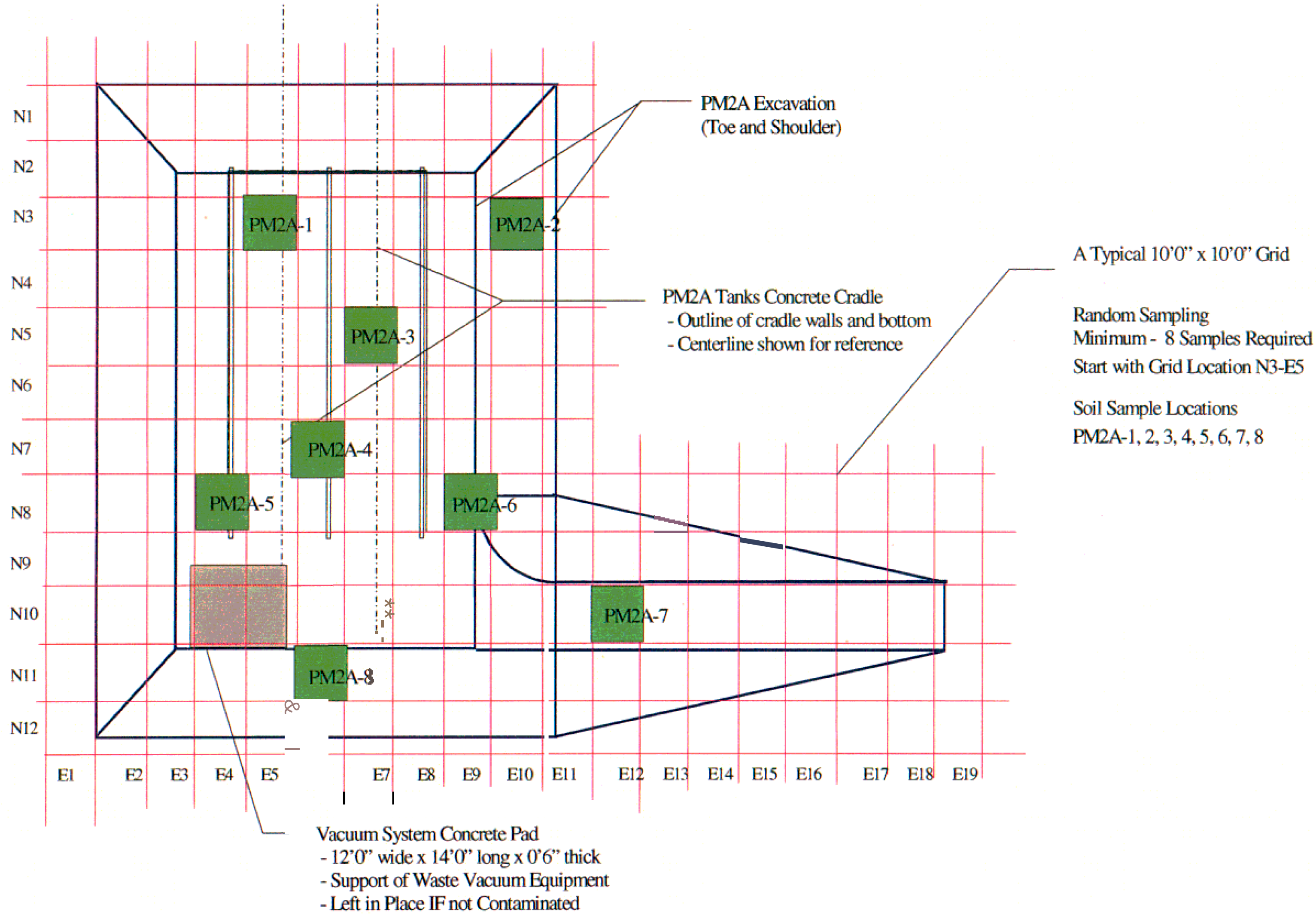

Figure 4-1. Proposed confirmation sample locations for the PM-2A Tanks site.

5. SAMPLING PROCESS DESIGN

Specific procedures are required to handle the radiological samples collected during the PM-2A tanks sampling activities to ensure that the data are representative of the soil within the tank areas. This section outlines the specific sampling process design for these activities. The sampling requirements discussed here will guide the collection of representative samples as specified in the DQOs (Section 4.1 of this plan). Procedures for sample collection are provided as guidelines for the field sampling team.

5.1 Presampling Meeting

Sampling procedures will be discussed each day in a presampling meeting. The meeting discussion will include, but is not limited to, sampling activities for the day, responsibilities of team members, health and safety issues, and waste management. Any deviations from the sampling strategy presented in this FSP will be documented in the field-sampling logbook.

5.2 Sample Collection

Prior to sampling, all sample locations will be identified, staked, and clearly marked with the appropriate designations. Staked sampling locations will be surveyed in accordance with the requirements set forth in PRD-5030/MCP-3480, "Sampling and Analysis Process for CERCLA and D&D&D Activities," to establish horizontal (northing and easting coordinates) and vertical (elevation referenced to mean sea level) control. Permanent benchmarks will be used to reference the vertical control data and the horizontal grid coordinates.

Horizontal (H) and vertical (V) control will be consistent with standard third order accuracy,

where

H = 1/5,000 or 5 seconds of arc

V = 0.05 feet per M (length of loop in miles).

Samples of the soil will be collected at the locations indicated on Figure 4-1. The samples will be submitted for a 20-minute gamma spectrometric analysis to evaluate Cs-137 concentrations in the soil, using field calibrated HPGe portable in situ gamma spectroscopy onsite. In addition, a NaI portable scintillometer will be used to scan the bottom of the excavation to identify any hot spots. Based on this screening, additional bias samples will be collectedfrom any hot spots detected by the NaI portable scintillometer.

5.3 Personal Protective Equipment

The PPE required for this sampling effort is discussed in the project HASP (INEEL 2003b) and the project radiation work permit. It may include, but is not limited to, gloves, respirator with cartridges, shoe covers, and coveralls.

5.4 Field Decontamination

Field decontamination procedures are designed to prevent cross-contamination between locations and samples. All equipment associated with sampling will be thoroughly decontaminated prior to daily activities and between sample locations, in accordance with PRD-5030/MCP-3480, "Sampling and

Analysis Process for CERCLA and D&D&D Activities." Following decontamination, sampling equipment will be protected to prevent contamination from windblown dust.

5.5 Sampling Waste Handling and Disposition

Waste streams generated as a result of the PM-2A tanks sampling activities may include (but are not limited to) PPE, sample supplies and equipment, rinse water (which may be used in small quantities during sampling), and excess or spent samples. All waste streams that are generated as a result of the sampling activities will be containerized for disposal in accordance with the project (INEEL 2003a).

5.6 Sample Equipment

Included below is a tentative list of equipment and supplies. This list is not exhaustive, and should only be used as a guide. Other equipment and supplies specified in the project-specific HASP are not included in this section. Sampling equipment that would come into contact with sample material will be cleaned prior to use, using an appropriate method (e.g., Alconox or similar non-phosphate soap with de-ionized water rinse, or equivalent). Field sampling and decontamination supplies may included the following:

- Stainless-steel hand augers
- Power auger
- Tape measure (30.5 m [100 ft])
- Wood stakes and ribbon (30.5 m [100 ft])
- Stainless steel spoons
- Stainless steel or aluminum composting pans
- Paper wipes
- Plastic garbage bags
- De-ionized water (20 L [5.3 gal] minimum)
- Non-phosphate-based soap
- Isopropanol
- Spray bottles
- Aluminum foil
- Pipe wrench
- Crescent wrench
- Hammer

- Tables
- Certified ultra pure water (5 L [1.3 gal] JT Baker)
- FTL logbook
- Controlled copies of the FSP, QAPjP, HASP, and applicable referenced procedures
- Black ink pens
- Black ultra-fine markers
- Sample containers, as specified in the QAPjP
- Nitrile or latex gloves
- Leather work gloves
- Ziploc plastic bags.

5.7 Documentation Revision Requests

Revisions to this document will follow MCP-233, "Process for Developing, Releasing, and Distributing ER Documents."

6. REFERENCES

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